# Partitioning Model Between Water Column and Sediments

Partitioning Model Objectives

- Estimate expected PCB concentrations in Spokane River bottom sediments, in response to observed water column PCB and particulate organic carbon data

- Potential outcome
  - If water column sources under-predict observed sediment concentrations, provides indirect evidence of an un-accounted for source

- Examine potential for stormwater sources to preferentially contribute to sediment contamination
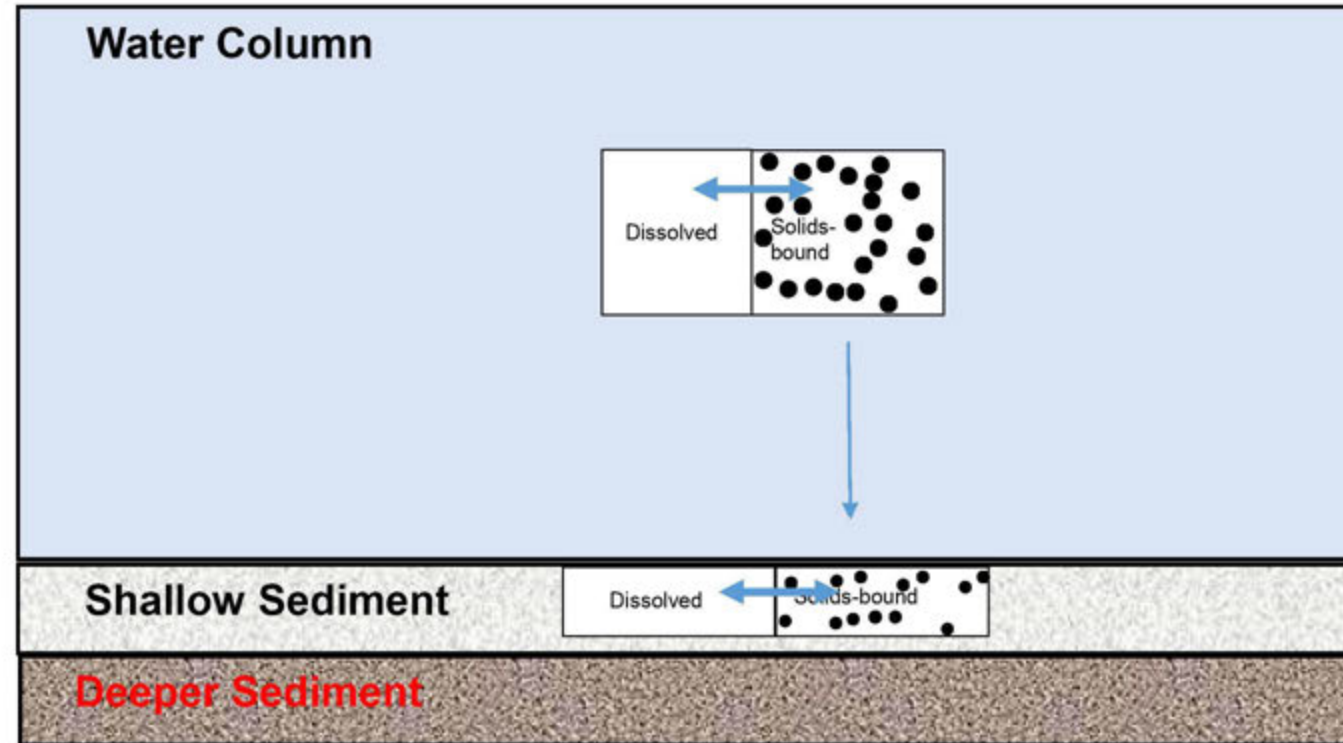
Partitioning Model Approach

- Apply model to estimate sediment PCB concentrations, assuming that they are driven solely by current water column concentrations

- Compare predicted sediment PCB concentration to observations
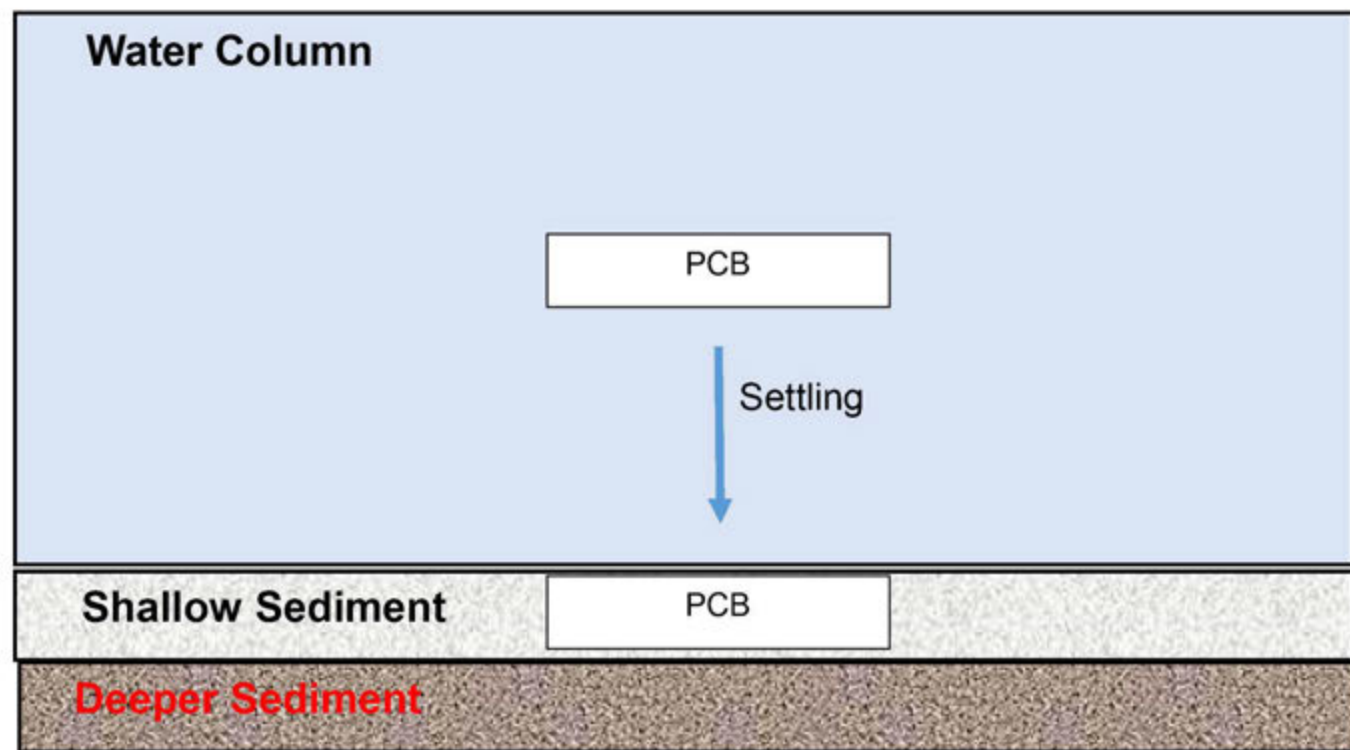
Partitioning Model Framework

- Assumes PCBs are either dissolved or bound to solids
- Model predicts amount in each phase based upon site-specific data on solids characteristics

Partitioning Model Inputs and Outputs

- Inputs
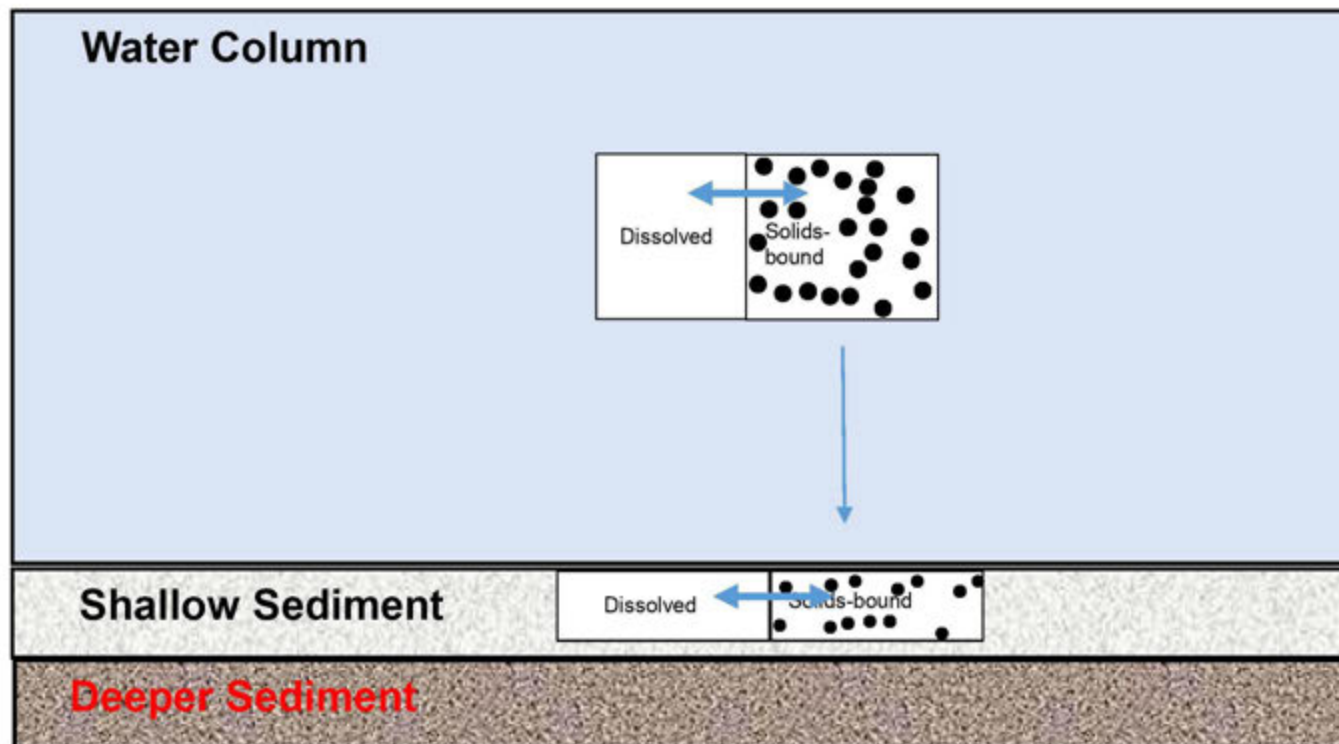 - Water column
    - Total PCB concentration
    - Suspended solids
    - Particulate organic carbon
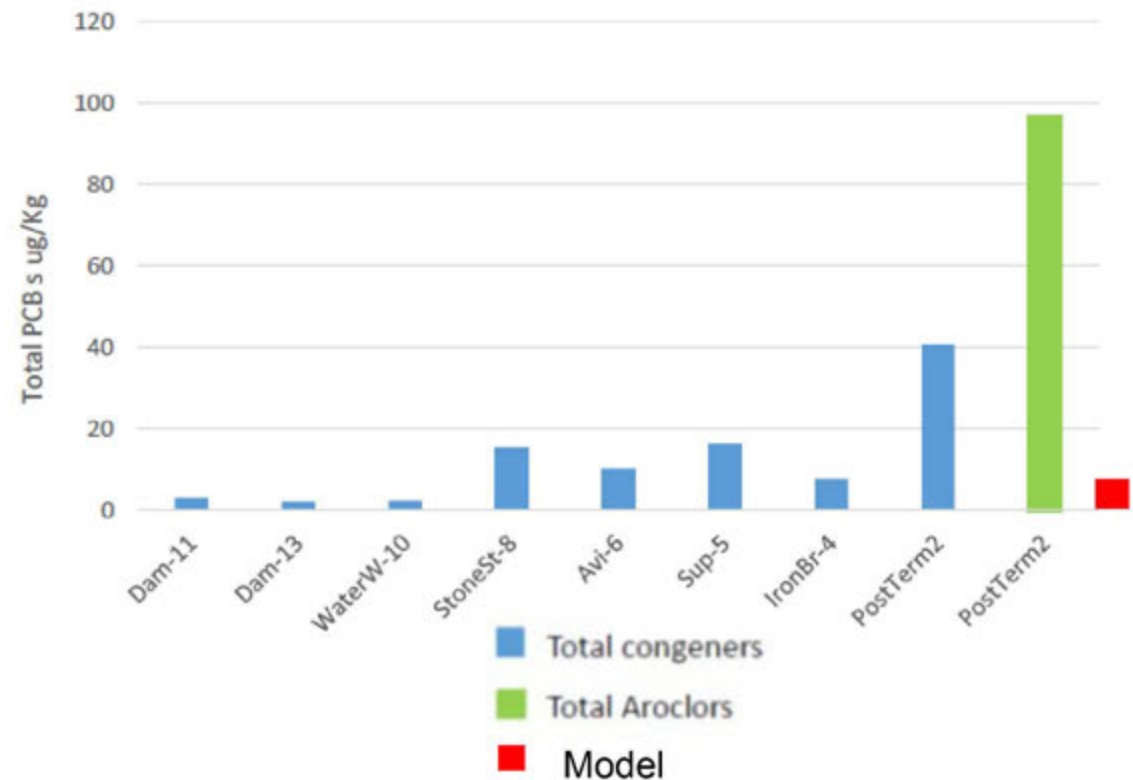   - Partition coefficient
  - Sediments
    - Organic carbon content
- Outputs
 - Solids-bound PCB in water column
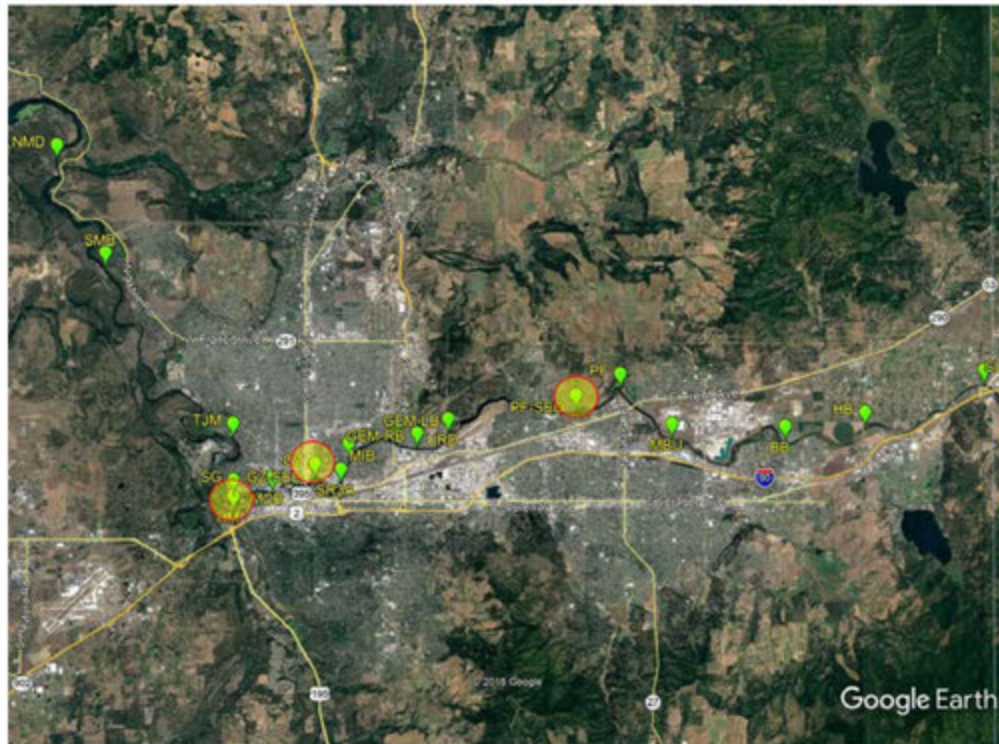 - PCB in sediments

Comparison of Model Predictions to 2013 Urban Waters Sediment Data

- Other than an one observed elevated concentration, model predictions are consistent with observations

Comparison of Model Predictions to 2018 Ecology Sediment Data

- Model is within the range of the observations
  - But the observed range is very large
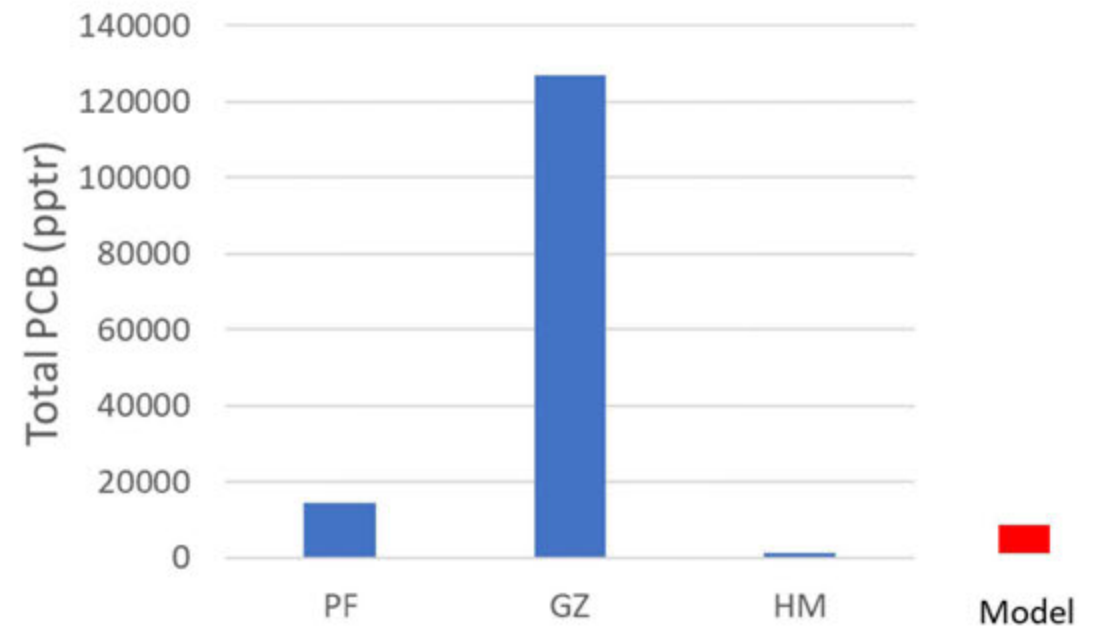
Partitioning Model: Dry Weather Conclusions

- PCB concentrations in bottom sediments are largely at expected levels
  - Exceptions exist
- How representative are occasional spikes?
  - Tough to say, from limited available data

Wet Weather Considerations

- Could stormwater sources to preferentially contribute to sediment contamination?

- Previous analysis considered only dry weather conditions
  - Low PCB and suspended solids concentration
  - Large majority of PCBs in dissolved phase

- Wet weather sources are quite different
  - Higher PCB and suspended solids concentrations
  - More PCBs in solids-bound form
  - Can these settle out and contribute to sediment contamination?

Wet Weather Approach

- Estimate fraction of stormwater solids that settle to bottom prior to Nine Mile Dam

  - Consider range of river flow conditions

    - Affect of flow on river velocity and depth

  - Obtain settling velocities from CE-QUAL-W2 water quality model

Wet Weather Model Inputs

- Flow conditions considered
  - Summer low flow
  - Fall/winter moderate flow
  - Spring high flow
- Hydraulic inputs

Period	Flow	Time of Passage (days)
Summer low flow	1246	2.51
Fall/winter moderate flow	3000	0.75
Spring high flow	10,000	0.23

- Settling velocities
  - Inorganic solids 1.5 m/d
  - Particulate organic matter 0.1 m/d

Wet Weather Model Results

- Percent of stormwater solids expected to settle to bottom by Nine Mile
  - Most solids expected to be transported downstream, except for denser particles during lower river flow

Period	Inorganic	Organic
Summer low flow	56%	5%
Fall/winter moderate flow	21%	2%
Spring high flow	6%	0%